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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/813,439	03/31/2004	Sung-Sok Choi	SEC.1140	3777

20987 7590 08/14/2007

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EXAMINER	
ZERVIGON, RUDY	

ART UNIT	PAPER NUMBER
1763	

MAIL DATE	DELIVERY MODE
08/14/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)
	10/813,439	CHOI ET AL.
	Examiner	Art Unit
	Rudy Zervigon	1763

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *05 June 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1 and 9-12* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1 and 9-12* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

2. Claims 1 and 9-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kim; Byong-dong et al. (US 5,990,016 A) in view of Strang; Eric J. (US 6,872,259 B2) and Watabe; Masahiro (US 5,500,256 A). Kim teaches an upper electrode (71/81; Figure 7, column 4, line 49 – column 5, line 22) for supplying process gas onto a wafer (13; Figure 7) in semiconductor device manufacturing equipment (Figure 7, column 4, line 49 - column 5,line22), comprising: a plate electrode (71/81; Figure 7, column 4, line 49 - column 5,line22), and a plurality of nozzles (82, 82a; Figure 8, column 4, line 49 - column 5,line22) integral with said plate electrode (71/81; Figure 7, column 4, line 49 - column 5,line22) so as to inject process gas supplied at one side of the plate electrode (71/81; Figure 7, column 4, line 49 - column 5,line22) into a processing chamber (column 5, lines 9-10) from the other side of the plate electrode (71/81; Figure 7, column 4, line 49 - column 5,line22), said nozzles (82, 82a; Figure 8, column 4, line 49 - column 5,line22) being configured to inject the process gas at a flow rate that is higher overall at a peripheral portion of said plate electrode (71/81; Figure 7, column 4, line 49 - column 5,line22) than at a central portion of said plate electrode (71/81; Figure 7, column 4, line 49 - column 5,line22) located radially inwardly of the peripheral portion (column 5, lines 10-33) – claim 1

Kim further teaches:

Kim does not teach:

i. one nozzle of the plurality of nozzles (82, 82a; Figure 8, column 4, line 49 - column 5,line22) being disposed at the center of the electrode plate (71/81; Figure 7, column 4, line 49 - column 5,line22), the remainder of the nozzles (82, 82a; Figure 8, column 4, line 49 - column 5,line22) being disposed in a plurality of concentric groups about the concentric nozzles (82, 82a; Figure 8, column 4, line 49 - column 5,line22), the nozzles (82, 82a; Figure 8, column 4, line 49 - column 5,line22) in each group being spaced apart from one another by equal amounts, the intervals between the central nozzles (82, 82a; Figure 8, column 4, line 49 - column 5,line22) in any one group and closest nozzles (82, 82a; Figure 8, column 4, line 49 - column 5,line22) in an adjacent group being decreased in a direction from the center of the electrode plate (71/81; Figure 7, column 4, line 49 - column 5,line22) toward the outer peripheral edge portion thereof, <u>wherein said nozzles (82, 82a; Figure 8, column 4, line 49 - column 5,line22) at the peripheral portion of the plate electrode plate electrode (71/81; Figure 7, column 4, line 49 - column 5,line22) have through-holes that are larger than those of the nozzle at the center portion of the plate electrode (71/81; Figure 7, column 4, line 49 - column 5,line22)</u> - claim 1

ii. Semiconductor manufacturing equipment, comprising: a processing chamber (column 5, lines 9-10); a supply line (not shown; inherent; Figure 8) through which process gas is supplied to Kim's chamber (column 5, lines 9-10); a plurality nozzles (82, 82a; Figure 8, column 4, line 49 - column 5,line22) being configured to inject the process gas at a flow rate that is higher overall at a peripheral portion of said plate electrode than at a central portion of said plate electrode located radially inwardly of the peripheral portion, one nozzle of the plurality of nozzles (82, 82a; Figure 8, column 4, line 49 - column 5,line22) being disposed at the center of the electrode plate (71/81; Figure 7, column 4, line 49 - column 5,line22) the remainder of the

nozzles (82, 82a; Figure 8, column 4, line 49 - column 5,line22) being disposed in a plurality of concentric groups about the central nozzles (82, 82a; Figure 8, column 4, line 49 - column 5,line22). the nozzles (82, 82a; Figure 8, column 4, line 49 - column 5,line22) in each group being spaced apart from one another by equal amounts the intervals between the central nozzles (82, 82a; Figure 8, column 4, line 49 - column 5,line22) in any one group and closest nozzles (82, 82a; Figure 8, column 4, line 49 - column 5,line22) in an adjacent group being decreased in a direction from the center of the electrode plate (71/81; Figure 7, column 4, line 49 - column 5,line22) toward the outer peripheral edge portion thereof; a controllable distributor operatively interposed between said supply line (not shown; inherent; Figure 8) and said nozzles (82, 82a; Figure 8, column 4, line 49 - column 5,line22) so as to control the flow of the process gas from the supply line (not shown; inherent; Figure 8) to the nozzles (82, 82a; Figure 8, column 4, line 49 - column 5,line22); an exhaust system connected to said processing chamber (column 5, lines 9-10) to create a vacuum within the chamber (column 5, lines 9-10); a pressure sensor that measures the pressure in the chamber (column 5, lines 9-10) interior; a database that stores information regarding the processing of a wafer (13; Figure 7) within Kim's chamber (column 5, lines 9-10); and a controller operatively connected to said database so as to receive the information stored by the database, operatively connected to said pressure sensor and said exhaust system so as to control the exhaust system to regulate the pressure with the chamber (column 5, lines 9-10) on the basis of the pressure sensed by said sensor, and operatively connected to said distributor for controlling the distributor to regulate the flow of the process gas to said nozzles (82, 82a; Figure 8, column 4, line 49 - column 5,line22), as claimed by claim 9

iii. The equipment as claimed in 9, wherein the distributor comprises: pipes diverging from the supply line (not shown; inherent; Figure 8) and each connected to a respective one of the nozzles (82a; Figure 8, column 4, line 49 - column 5,line22); and a control valve disposed in-line with the divergent pipes, and operatively connected to said controller, as claimed by claim 10

iv. The equipment as claimed in 10, wherein the distributor compris3es: a support plate disposed above said nozzles (82, 82a; Figure 8, column 4, line 49 - column 5,line22); and control members supported by said support plate so as to be movable in a direction towards and away from said nozzles (82, 82a; Figure 8, column 4, line 49 - column 5,line22); and an elevating mechanism operatively connected to said control members so as to position said control members relative to said control valve, said elevating mechanism being operatively connected to said controller, as claimed by claim 11

v. The equipment as claimed in 11, and further comprising a plate electrode (71/81; Figure 7, column 4, line 49 - column 5,line22) with which said nozzles (82, 82a; Figure 8, column 4, line 49 - column 5,line22) are integrated, said having a plurality of grooves extending from an upper surface thereof to each of said nozzles (82, 82a; Figure 8, column 4, line 49 - column 5,line22), respectively, and wherein each of said control members has a lower end having a shape corresponding to the shape of a respective one of said grooves and is disposed opposite thereto, whereby the control members can be seated in said grooves, as claimed by claim 12

Strang teaches one nozzle of the plurality of nozzles (160; Figure 3G-I; 250; Figure 5) being disposed at the center of the electrode plate (50; Figure 5; column 9, lines 23-43), the remainder of the nozzles (160; Figure 3G-I; 250; Figure 5) being disposed in a plurality of concentric

groups (450; Figure 5) about the concentric nozzles (160; Figure 3G-I; 250; Figure 5), the nozzles (160; Figure 3G-I; 250; Figure 5) in each group (450; Figure 5) being spaced apart from one another by equal amounts - claim 1,9

Strang further teaches a controllable distributor (Figure 3G) operatively interposed between said supply line (74', 74'', 74'''; Figure 3G) and said nozzles (160; Figure 3G-I) so as to control the flow of the process gas from the supply line (74', 74'', 74'''; Figure 3G) to the nozzles (160; Figure 3G-I); an exhaust system (66; Figure 2B) connected to said processing chamber (14; Figure 2B) to create a vacuum within the chamber (14; Figure 2B); a pressure sensor (column 17, lines 27-40) that measures the pressure in the chamber (14; Figure 2B) interior; a database (80; Figure 2B) that stores information regarding the processing of a wafer (13; Figure 7) within Strang's chamber (14; Figure 2B); and a controller (80; Figure 2B) operatively connected to said database (80; Figure 2B) so as to receive the information stored by the database (80; Figure 2B), operatively connected to said pressure sensor (column 17, lines 27-40) and said exhaust system (66; Figure 2B) so as to control the exhaust system (66; Figure 2B) to regulate the pressure with the chamber (14; Figure 2B) on the basis of the pressure sensed by said sensor, and operatively connected to said distributor (Figure 3G) for controlling the distributor (Figure 3G) to regulate the flow of the process gas to said nozzles (160; Figure 3G-I) - claim 9

vi. The equipment as claimed in 9, wherein the distributor (Figure 3G) comprises: pipes (150', 150'', 150'''; Figure 3G) diverging from the supply line (74', 74'', 74'''; Figure 3G) and each connected to a respective one of the nozzles (160; Figure 3G); and a control valve (154; Figure 3C,G) disposed in-line with the divergent pipes (150', 150'', 150'''; Figure 3G), and operatively connected to said controller (80; Figure 2B), as claimed by claim 10

vii. The equipment as claimed in 10, wherein the distributor (Figure 3G) comprises: a support plate (154; Figure 3C,G) disposed above said nozzles (160; Figure 3G-I); and control members (160L; Figure 3B) supported by said support plate (154; Figure 3C,G) so as to be movable in a direction towards and away from said nozzles (160; Figure 3G-I); and an elevating mechanism (180; Figure 3B) operatively connected to said control members (160L; Figure 3B) so as to position said control members (160L; Figure 3B) relative to said control valve (154; Figure 3C,G), said elevating mechanism (180; Figure 3B) being operatively connected to said controller (80; Figure 2B), as claimed by claim 11

viii. The equipment as claimed in 11, and further comprising a plate electrode (90; Figure 2B) with which said nozzles (160; Figure 3G-I) are integrated, said having a plurality of grooves (166i; Figure 3I) extending from an upper surface thereof to each of said nozzles (160; Figure 3G-I), respectively, and wherein each of said control members (160L; Figure 3B) has a lower end having a shape corresponding to the shape of a respective one of said grooves (166i; Figure 3I) and is disposed opposite thereto, whereby the control members (160L; Figure 3B) can be seated in said grooves (166i; Figure 3I), as claimed by claim 12

Watabe teaches a gas distribution plate (Figure 4A,B) for use in a wafer processing system (Figure 1). Watabe specifically teaches <u>nozzles (2d; Figure 4A, column 8; lines 10-16) at the peripheral portion of the plate electrode (11; Figure 1,4A, column 3, lines 18-25) have through-holes that are larger (column 8; lines 10-16) than those of the nozzle (2a; Figure 4A, column 8; lines 10-16) at the center portion of the plate electrode (71/81; Figure 7, column 4, line 49 - column 5,line22) – claim 1</u>

It would have been obvious to one of ordinary skill in the art at the time the invention was made to add Strang's controllable distributor (Figure 3G), with optimized nozzle distribution and size of Strang's Figure 5, to Kim's apparatus.

Motivation to add Strang's controllable distributor (Figure 3G), with optimized nozzle distribution and size of Strang's Figure 5, to Kim's apparatus is for improving etching and deposition processes as taught by Strang (column 8; lines 30-40) and for optimizing "the coalescence of gas jets, or to increase or decrease the flux of fresh gas in chosen areas over the wafer" as taught by Strang (column 16, lines 4-23). Further, Watabe teaches that the variable size and distribution of holes on a gas injection plate permits control of gas conductances through said plate imparting special control of gas distributions (column 8; lines 20-26; column 3; lines 18-25).

Response to Arguments

3. Applicant's arguments filed June 5, 2007 have been fully considered but they are not persuasive.

4. Applicant emphasizes that none of the cited prior art teach or fairly suggest the independent claims limitation:

"

the intervals between the central nozzles in any one group and closest nozzles in an adjacent group being decreased in a direction from the center of the electrode plate toward the outer peripheral edge portion thereof ....

"

In response, the Examiner cited Watabe as teaching a gas distribution plate (Figure 4A,B) for use in a wafer processing system (Figure 1). Watabe specifically teaches nozzles (2d; Figure 4A, column 8; lines 10-16) at the peripheral portion of the plate electrode (11; Figure 1,4A, column 3, lines 18-25) have through-holes that are larger (column 8; lines 10-16) than those of the nozzle (2a; Figure 4A, column 8; lines 10-16) at the center portion of the plate electrode (71/81; Figure 7, column 4, line 49 - column 5,line22) – claim 1. The Examiner believes this conveyed teaching of Watabe specifically address Applicant's relative "grouping" of nozzles by both relative size and relative grouping distances with respect to the entire gas distribution plate surface area. Further, the Examiner notes that Watabe's Figures 4A,B are not to scale and at a minimum convey that such relative "grouping" by size (indicated by Watabe's "d"; Figure 4A) and distribution (indicated by Watabe's "P"; Figure 4A; column 8; line 11) on Watabe's gas distribution plate are *result effective variables* directly imparting a desired gas flow conductance (column 8, lines 17-26) depending on the desired processing and film distributions as taught by Watabe (column 8; lines 32-57). It is because Watabe's figures are not to scale that arguments based on relative group size and relative group placement is not constructive for anticipation. Further, proportions of features in a drawing are not evidence of actual proportions when drawings are not to scale. Because the reference does not disclose that the drawings are to scale and is silent as to dimensions, arguments based on measurement of the drawing features are of little value. However, the description of the article pictured can be relied on, in combination with the drawings, for what they would reasonably teach one of ordinary skill in the art. (In re Wright,193 USPQ 332 (CCPA 1977). MPEP 2125. Under obviousness considerations, it is well established that changes in apparatus dimensions are within the level of ordinary skill in the

art.(Gardner v. TEC Systems, Inc. , 725 F.2d 1338, 220 USPQ 777 (Fed. Cir. 1984), cert. denied , 469 U.S. 830, 225 USPQ 232 (1984); In re Rose , 220 F.2d 459, 105 USPQ 237 (CCPA 1955); In re Rinehart, 531 F.2d 1048, 189 USPQ 143 (CCPA 1976); See MPEP 2144.04).

Applicant further states that Watabe's figure 4A is not concentric because Watabe discloses a "spiral". Applicant's argument is similar to the above argument in that the "grouping" of gas distribution holes is required according to a specific spacing and relative placement. As stated above, because Watabe teaches optimization of "grouping" by size (indicated by Watabe's "d"; Figure 4A) and distribution (indicated by Watabe's "P"; Figure 4A; column 8; line 11) on Watabe's gas distribution plate are *result effective variables* directly imparting a desired gas flow conductance (column 8, lines 17-26) it would be obvious to one of ordinary skill in the art at the time the invention was made to appreciate that such relative positioning and/or sizing of Watabe's gas distribution holes is within the level of ordinary skill. Specifically, such geometric/dimensional reorganizations would be expected based on Watabe's process scaling (column 8; lines 32-57).

Conclusion

5. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37

CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Examiner Rudy Zervigon whose telephone number is (571) 272-1442. The examiner can normally be reached on a Monday through Thursday schedule from 8am through 7pm. The official fax phone number for the 1763 art unit is (571) 273-8300. Any Inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Chemical and Materials Engineering art unit receptionist at (571) 272-1700. If the examiner can not be reached please contact the examiner's supervisor, Parviz Hassanzadeh, at (571) 272-1435.

6/9/7